REMARKS

The Office action has been carefully considered. The Office action rejected claims 1-6 and 8-18 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,809,328 to Nogales et al. ("Nogales"). Further, the Office action objected to claims 7, 19, and 20 as being based on rejected independent claims but would be allowable if rewritten in independent form to include all of the limitations of any intervening claims. Applicants thank the Examiner for indication of allowable subject matter and respectfully disagree with the rejections.

Prior to discussing reasons why applicants believe that the claims in this application are clearly allowable in view of the teachings of the cited and applied references, a brief description of the present invention is presented.

Brief Summary of the Present Invention

The present invention is directed to system and method for implementing control logic using data structure management, as opposed to finite state machines, to manipulate the inbound and outbound data streams in a fibre channel. As such, a fibre channel interface according to the present invention converts data streams from one data structure to another, and, the manner in which the fibre channel manipulates the data stream is one aspect of the present invention that is novel.

It is well known in the art that fibre channels are used as a communications interface between a computer-level bus architecture and a data transmission-level network. When such a fibre channel is used, data streams that are received from the network typically comprise a serial communication. The fibre channel is able to convert the received serial data stream into a

parallel data stream that is suitable for transmission onto a computer bus, such as a PCI bus. Likewise, when data streams are to be sent from the fibre channel to a remote location on the network, the parallel data stream from the computer bus is converted to a serial data stream suitable for transmission on the network. In the past, this conversion has been performed by devices such as fibre channel interfaces using complex finite state machines within an interface controller. A good example of such a conventional fibre channel interface is the subject matter of the teachings of the cited and applied reference, Nogales.

Embodiments of the present invention, however, are not directed to a simple fibre channel interface controller having finite state machines as disclosed in Nogales. Rather, a fibre channel interface according to the present invention utilizes a controller having a number of subcontrollers, called managers, to distinguish between different "contexts" in which data may be received by the fibre channel interface. A context describes a task or thread that is processed by the controller and is a fundamental unit of task management for the controller. Thus, each manager is provided with a particular data structure to store individual contexts. This relationship can be likened somewhat to classes (managers having data structures) and instances (data in contexts) in object-oriented programming.

When data (typically in a format called outbound descriptor block) is received as part of a data sequence at the outbound sequence manager (OSM) of the fibre channel interface, the appropriate manager is called upon to process the data in context according to its particular data structure. Then, when the data is required for a different purpose, such as transmission to a remote node

on the network, the data (now stored in a first data structure) may be transferred to a different context (*i.e.* a second data structure) by simple data manipulation as opposed to running the data through a complex finite state machines as has been done in the past.

Note that the above description is for example and informational purposes only, and should not be used to interpret the claims, which are discussed below.

Brief Summary of the Cited and Applied Reference

Nogales teaches, generally, an apparatus for adapting transmissions between an industry-standard data bus of a host computer and a fibre channel coupled between the host computer and a peripheral storage sub-system. The apparatus is aimed at sharing data between a cluster of work stations in an effort to utilize several processors for parallel computing when dealing with bottleneck communication issues. As such, the system and method taught by Nogales utilizes a fibre channel controller (31) and a main processor (22) of the host computer to control the manipulation of data in shared registers in buffer memory (30) throughout a cluster of work stations. See column 6, lines 42-57 of Nogales. Essentially, the host processor determines the routing of operations (read or write) to be performed and decides which of the work stations or peripheral devices in the cluster will perform the operation. The host processor uses fibre channel links to each peripheral device for assigning operations to be performed remotely. See generally, FIG. 1 and column 2, lines 54-62 of Nogales.

Referring to FIG. 2 and column 6, lines 58-67 of Nogales, in the case of a write command, the fibre channel controller reads the data from the buffer

memory (30) and sends the data to a gigabit link module (GLM, 32) for processing from one data structure (PCI bus architecture) to a another data structure (serial bus or network architecture). Likewise, in the case of a read command, the fibre channel controller reads the data received on the fibre channel at the GLM (32) and stores the received data (after a parallel-to-serial conversion in the buffer memory (30) until directed elsewhere later by the host processor. As a result, data may be transferred back and forth via a fibre link to peripheral devices.

Nogales, however, is completely silent as to how the data stored in the buffer memory is transformed from one data structure to another when outbound data is sent to the GLM or received from the GLM. The Office action correctly noted that the GLM block is configured to perform a serial-to-parallel conversion for write commands and a parallel-to-serial conversion for read commands. However, Nogales provides no more detail as to how this conversion is accomplished. As was argued in the previous Office action response, Nogales does not show any cognition, let alone teach a particular manner in which parallel to serial conversions of data take place. Simply stating that a conversion takes place (which is not novel to the invention is Nogales) does not teach the conversion process. It was argued previously that, Nogales, by conventional systems and known methods, uses one or more finite state machines within the GLM to accomplish the conversion from one data structure to the next as is the case with the above-mentioned prior art; one of the very problems that that the present invention is aimed at solving.

The Rejections based on §103(a)

Turning to the claims, independent claim 1 recites a method for implementing a hardware controller that concurrently executes a number of tasks by carrying out operations on behalf of the tasks, the method comprising determining a format for a context, comprising stored information related to a task, that represents the task, determining possible states, and transitions between states, that a context representing a task currently executed by the hardware controller can occupy at each point in the execution of the task, transitions representing operations performed on behalf of a task by the hardware controller, partitioning the states and operations carried out by the hardware controller into a number of managers each containing a number of related states and carrying out a number of operations associating each manager with a data structure for storing contexts occupying states contained by the manager, defining a data-structure-manipulator manager that implements the data structures and that transfers contexts from one data structure to another, defining a command interface to the data-structure-manipulator manager for each manager, and implementing the managers and data-structure-manipulator manager, according to the determined states and transitions, so that, when a first manager carries out an operation that results in transition of a context to a state contained in a second manager, the first manager generates a command to the data-structure-manipulator manager to transfer the context from the data structure associated with the first manager to the data structure associated with the second manager.

The Office action rejected claim 1 as unpatentable over Nogales. More specifically, the Office action contends that Nogales teaches determining a

format for a context, comprising stored information related to a task, that represents the task. Column 6, lines 29-33 of Nogales are referenced. Further, the Office action contends that Nogales teaches determining possible states, and transitions between states, that a context representing a task currently executed by the hardware controller can occupy at each point in the execution of the task, transitions representing operations performed on behalf of a task by the hardware controller. Column 6, line 34 of Nogales is referenced. Still further, the Office action contends that Nogales teaches associating each manager with a data structure for storing contexts occupying states contained by the manager. Column 5, lines 7-13 of Nogales are referenced. Further yet, the Office action contends that Nogales teaches defining a data-structure-manipulator manager that implements the data structures and that transfers contexts from one data structure to another and defining a command interface to the data-structure-manipulator manager for each manager. Column 6, lines 42-57 of Nogales are referenced. The Office action also contends that Nogales teaches implementing the managers and data-structure-manipulator manager, according to the determined states and transitions, so that, when a first manager carries out an operation that results in transition of a context to a state contained in a second manager, the first manager generates a command to the data-structure-manipulator manager to transfer the context from the data structure associated with the first manager to the data structure associated with the second manager. Column 6, lines 21-57 of Nogales are referenced.

The Office action acknowledges that Nogales fails to teach partitioning the states and operations carried out by the hardware controller into a number of managers each containing a number of related states and carrying out a

number of operations. However, the Office action contends that it is well known in the art to group related states together with a manager because it simplifies work for the manager. The Office action then concludes that the recitations of claim 1 are not patentable over the teachings of Nogales. Applicants respectfully disagree.

To establish *prima facie* obviousness of a claimed invention, all of the claim recitations must be taught or suggested by the prior art; (*In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)), and "all words in a claim must be considered in judging the patentability of that claim against the prior art;" (*In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)). Further, if prior art, in any material respect teaches away from the claimed invention, the art cannot be used to support an obviousness rejection. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed Cir. 1997). Moreover, if a modification would render a reference unsatisfactory for its intended purpose, the suggested modification / combination is impermissible. See MPEP § 2143.01

The present invention is directed to a particular manner for accomplishing a conversion of data from one data structure to another which is clearly recited in the claim 1. Specifically, claim 1 recites determining a format for a context, comprising stored information related to a task, that represents the task. That is, the system determines the kind of format in which the stored information related to a task (which is in a context) is currently in. Knowing the current format, the processor is able to determine which possible states and transitions between states in which the context may be manipulated.

Next, claim 1 recites determining possible states, and transitions between states, that a context representing a task currently executed by the hardware controller can occupy at each point in the execution of the task, transitions representing operations performed on behalf of a task by the hardware controller. The Office action cited PCI Interface Logic (column 6, line 34 of Nogales) as teaching this concept. It is not understood how the words "PCI Interface Logic" teaches determining possible states, and transitions between states, that a context representing a task currently executed by the hardware controller can occupy at each point in the execution of the task, transitions representing operations performed on behalf of a task by the hardware controller. Clearly, Nogales shows no understanding or appreciation of possible states and transitions between states that a context representing a task currently executed by the hardware controller can occupy. At best, Nogales teaches PCI Interface Logic that helps facilitate communication between a PCI bus and buffer memory. However, there is certainly no disclosure in Nogales as to how this communication is carried out. It is quite a stretch to assume that the communication involves contexts having states and transitions between states.

Further, claim 1 recites partitioning the states and operations carried out by the hardware controller into a number of managers each containing a number of related states and carrying out a number of operations. The Office action contends that this recitation is obvious because grouping similar tasks together eases manager's workload. It is not understood how Nogales can teach managers for carrying out a number of operations related to similar states when Nogales does not show any cognizance of states or transitions between states. Again, throughout Nogales, the only disclosure directed to format

conversion simply states that a GLM block performs a parallel-to-serial conversion.

Further yet, claim 1 recites associating each manager with a data structure for storing contexts occupying states contained by the manager. Again, Nogales shows no cognition of the concept of states or transitions between states, thus, Nogales cannot possibly teach associating managers with a data structure for storing contexts, let alone the specific data structures that correspond to particular states in which the contexts may be, which are also, in turn, associated with the managers.

Each of the remaining recitations in claim 1 also recites specific manipulation of contexts, states associated therewith, and transitions between said states using managers. As was shown above, Nogales falls significantly short of teaching all of the recitations of claim 1. In essence, the Office action is stating that Nogales, by stating that the GLM block performs parallel-to-serial conversions or vice versa would render obvious each and every recitation in claim 1. Such broad, conclusory statements do not come close to adequately addressing the issue of motivation to combine, are not evidence of obviousness, and therefore are improper as a matter of law. *In re Dembiczak,* 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999).

Applicants submit that claim 1 is allowable over the prior art of record for at least the foregoing reasons.

Applicants respectfully submit that dependent claims 2-7, by similar analysis, are also allowable. Each of these claims depends either directly or indirectly from claim 1 and consequently includes the recitations of independent claim 1. As discussed above, Nogales fails to disclose the recitations of claim 1

and, therefore, these claims are also allowable over the prior art of record. In addition to the recitations of claim 1 noted above, each of these dependent claims includes additional patentable elements.

For example, claim 3 recites the data-structure-manipulator manager comprises a manipulator logic circuit for each manager, a manipulator logic circuit for a manager together with the command interface defined for the manager composing a manipulator within the data-structure-manipulator manager corresponding to the manager. As was discussed above, Nogales does not teach, nor is even cognizant of the concept of states or transitions between states which are ostensibly handled by managers as recited in claims 1 and 3. Thus, Nogales cannot possibly teach a manipulator logic circuit for a manager.

Turning to the next independent claim, claim 8 recites a method for implementing a hardware controller that concurrently executes a number of tasks, the method comprising representing each task executed by the hardware controller as a context, each context occupying a state determined by the contents of at least one field within the context, a context transitioning from one state to another state when the hardware controller carries out an operation on behalf of the task represented by the context, partitioning hardware controller operations and associated context states into a number of logical managers, associating each logical manager with one of a number logical data structures for storing contexts occupying states within the logical manager, and implementing the logical managers and a data-structure manipulator that contains the contexts, logical data structures, and a command interface through which each logical manager issues commands to direct the data-structure

manipulator to transfer a context from the data structure associated with the logical manager to a different data structure.

The Office action rejected claim 8 as being unpatentable over Nogales for the same reasons as given in the rejection of claim 1. Applicants respectfully disagree.

As was discussed above, Nogales does not teach, nor is even cognizant of the concept of states and transitions between states within a context as recited in claim 8. Thus, Nogales cannot possibly be construed to teach the recitations of claim 8 such as each context occupying a state determined by the contents of at least one field within the context, a context transitioning from one state to another state, partitioning hardware controller operations and associated context states into a number of logical managers, associating each logical manager with one of a number logical data structures for storing contexts occupying states within the logical manager, and implementing the logical managers and a data-structure manipulator that contains the contexts.

Applicants submit that claim 8 is patentable over the prior art of record for at least the foregoing reasons.

Applicants respectfully submit that dependent claims 8-12, by similar analysis, are also allowable. Each of these claims depends either directly or indirectly from claim 8 and consequently includes the recitations of independent claim 8. As discussed above, Nogales fails to disclose the recitations of claim 8 and, therefore, these claims are also allowable over the prior art of record. In addition to the recitations of claim 8 noted above, each of these dependent claims includes additional patentable elements.

Turning to the last independent claim, claim 13, recites a subcomponent controller within a communication controller comprising data storage elements that together compose a number of contexts for storing information related to a sequence of data to be exchanged through a communications medium connected to the communication controller, logical managers that are each associated with a data structure and that each carries out operations on behalf of contexts stored within the associated data structure, and a data-structure manipulator that implements a number of data structures for storing contexts and that transfer contexts between data structures in response to receiving transfer commands from the logical managers.

The Office action rejected claim 13 as being unpatentable over Nogales. More specifically, the Office action contends that Nogales teaches data storage elements that together compose a number of contexts for storing information related to a sequence of data to be exchanged through a communications medium connected to the communication controller. Column 6, lines 47-57 of Nogales are referenced. Further, the Office action contends that Nogales teaches logical managers that are each associated with a data structure and that each carries out operations on behalf of contexts stored within the associated data structure. Column 6, lines 29-34 of Nogales are referenced. Finally, with respect to claim 13, the Office action contends that Nogales teaches a data-structure manipulator that implements a number of data structures for storing contexts and that transfer contexts between data structures in response to receiving transfer commands from the logical managers. Column 6, lines 42-57 of Nogales are referenced. Applicants respectfully disagree.

As was discussed above, Nogales does not teach transferring contexts between data structures. In fact, Nogales shows no teaching whatsoever as to how conversion of data takes place. Rather, Nogales teaches a method and system directed to assigning tasks to one of several peripheral devices via a fibre channel interface. Nogales is particularly unconcerned with the manner in which these tasks (read or write commands) are structured for the fibre channel. In fact, Nogales simplifies the process by merely stating that data undergoes a parallel-to-serial conversion inside the GLM block, but leaves the discussion at this simplified top level. Thus, Nogales cannot possibly be construed to teach the recitations of claim 13 such as data storage elements that together compose a number of contexts for storing information, logical managers that are each associated with a data structure and that each carries out operations on behalf of contexts, and data-structure manipulator that implements a number of data structures for storing contexts and that transfer contexts all of which are directed to a particular manner in which data may be converted from one format to another.

Applicants submit that claim 13 is patentable over the prior art of record for at least the foregoing reasons.

Applicants respectfully submit that dependent claims 14-20, by similar analysis, are also allowable. Each of these claims depends either directly or indirectly from claim 13 and consequently includes the recitations of independent claim 13. As discussed above, Nogales fails to disclose the recitations of claim 13 and, therefore, these claims are also allowable over the prior art of record. In addition to the recitations of claim 13 noted above, each of these dependent claims includes additional patentable elements.

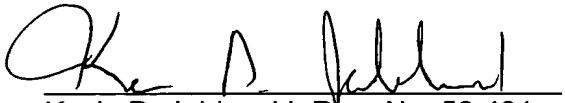
For at least the forgoing reasons, applicants submit that all the claims are patentable over the prior art of record. Reconsideration and withdrawal of the rejections in the Office Action is respectfully requested and early allowance of this application is earnestly solicited.

CONCLUSION

In view of the foregoing remarks, it is respectfully submitted that claims 1-20 are patentable over the prior art of record, and that the application is in good and proper form for allowance. A favorable action on the part of the Examiner is earnestly solicited.

If in the opinion of the Examiner a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney at (425) 822-3668.

Respectfully submitted,



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CERTIFICATE OF MAILING

I hereby certify that this Amendment along with Transmittal are being deposited with the United States Postal Service on the date shown below with sufficient postage as First Class Mail in an envelope addressed to: Assistant Commissioner for Patents, Alexandria, VA 22313-1450.

Date: Nov 5, 2004

Kevin D. Jablonski

10992461-1 Amendment